C&DH

2A 1553 BUS FAILURE

CAUTION
ALARM

Caution ①
UB Orb N1-1 Bus Failure

Advisory
UB EPS N1-14 Bus Failure

UB EPS N1-23 Bus Failure

CB GNC N1-1 Bus Failure

CB GNC N1-2 Bus Failure

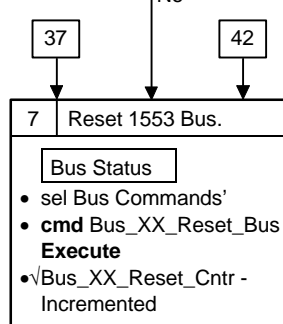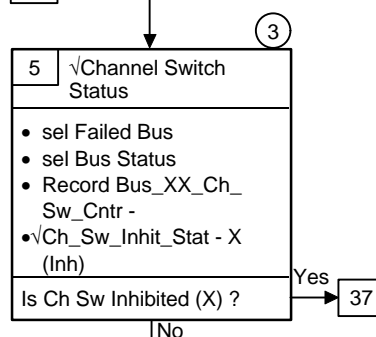LB Sys Lab-1 Bus Failure

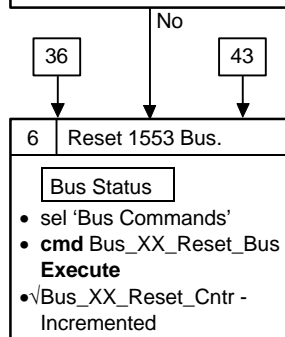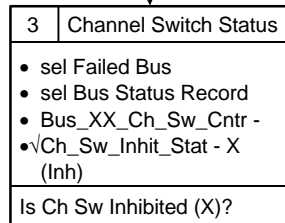LB Sys Lab-2 Bus Failure

Nominal Config:
Bus FDIR = Ena
Comm via Early COMM or OIU

N1-2 State = Prim
N1-1 State = Second

Active Tlm Sink = FGB

Auto Retry = Ena

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1 | √Bus Failure On Primary Display

Node 1: C&DH: MDM N1-2

PRIMARY NCS MDM Node1

• √State - Primary
• √MDM ID - N1-2
• √ ⚠ Symbol appears by the failed bus.

Is the failed bus CB GNC-2, or LB Sys Lab-2, or UB EPS N1-14, or UB EPS N1-23?

— No → (to box 2)
— Yes ↓

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3 | Channel Switch Status

• sel Failed Bus
• sel Bus Status Record
• Bus_XX_Ch_Sw_Cntr -
• √Ch_Sw_Inhit_Stat - X (Inh)

Is Ch Sw Inhibited (X)?
— Yes → 36
— No ↓

36   43

↓

6 | Reset 1553 Bus.

Bus Status

• sel 'Bus Commands'
• **cmd** Bus_XX_Reset_Bus **Execute**
• √Bus_XX_Reset_Cntr - Incremented

↓

10

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2 | Failure On Second Display

Node 1: C&DH: MDM N1-1

SECONDARY NCS MDM Node1

• √State - Secondary
• √MDM ID - N1-1
• √ ⚠ Symbol appears by and/or yellow color on the failed bus.

Is the failed bus CB GNC 1, or LB Sys Lab-1, or UB Orb N1-1?

— No → 4
— Yes ↓

4
• √**MCC**

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③

5 | √Channel Switch Status

• sel Failed Bus
• sel Bus Status
• Record Bus_XX_Ch_Sw_Cntr -
• √Ch_Sw_Inhit_Stat - X (Inh)

Is Ch Sw Inhibited (X) ?
— Yes → 37
— No ↓

37   42

↓

7 | Reset 1553 Bus.

Bus Status

• sel Bus Commands'
• **cmd** Bus_XX_Reset_Bus **Execute**
• √Bus_XX_Reset_Cntr - Incremented

↓

8

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① UB Orb_N1-1 is the only bus that generates this caution message. However, this bus only has a few RTs on it: OIU 1 and 2 (not always present), 4 CBMs (usually off), and FGB 1 and 2 (only one is active on the Primary MDM). So, most of the time, there is no I/O on the bus; hence, there is no caution message generated (no bus failure). In addition, there are cases with only one RT on the bus. In these cases, the failure of the RT itself will also cause the bus to fail. Only the caution and warning messages generate the yellow color on the jailed bus.

② GNC-2 bus has only two RTs on it: N1-1 MDM and a CBM (usually off). GNC-1 only has one CBM (usually off).

③ 'Bus_XX_' is the Ops name of the actual failed bus (e.g., CB GNC_2). The 'Bus_XX_', nevertheless, has to be one of the buses in box 1 or 2.

┌─────┐
│ 4 │
└─────┘
MDM state transition
will affect all other
space station
subsystems
connected to that
MDM. Make sure
that all other
disciplines agree
with the execution of
this step.

```
                                    ┌─────┐
                                    │  7  │
                                    └──┬──┘
                                       │
                                       ▼
                        ┌──────────────────────────────┐
                        │  8  │ √Bus Recovery           │
                        ├──────────────────────────────┤
                        │  Node 1: C&DH: MDM            │
                        │  N1-1                         │
                        │   ┌──────────────────────┐    │
                        │   │ SECONDARY NCS        │    │
                        │   │ MDM Node 1           │    │
                        │   └──────────────────────┘    │
                        ├──────────────────────────────┤
          ┌─────┐       │  Is the attention symbol gone │ No    ┌──────────────────────────────┐
          │  6  │       │  and does color change from   ├──────▶│  9  │                         │
          └──┬──┘       │  yellow to green on Orb bus   │       ├──────────────────────────────┤
             │          │  (If this is the failed bus)? │       │ •√MCC to see if it is OK to   │
             ▼          └───────────────┬───────────────┘       │   perform the State           │
┌──────────────────────────┐            │ Yes                   │   Transition.                 │
│ 10  │ √Bus Recovery       │            │                       └───────────────┬──────────────┘
├──────────────────────────┤            │                                       │
│  Node 1: C&DH: MDM        │            │                                       ▼
│  N1-2                     │            │                                   ┌─────┐
│   ┌──────────────────┐    │            │                                   │ 15  │
│   │ PRIMARY NCS MDM  │    │            │                                   └─────┘
│   │ Node1            │    │            │
│   └──────────────────┘    │            │
├──────────────────────────┤ Yes  ┌────────────────────────────┐
│  Is the attention symbol  ├─────▶│ 11  │ Transient failure.   │
│  gone?                    │      └──────────────┬─────────────┘
└─────────────┬────────────┘                      │
              │ No                                 │
              ▼         ┌─────┐                     │
┌──────────────────────┐│  4  │                     ▼
│ 12  │                └─────┘         ┌────────────────────────────┐
├──────────────────────────┐          │ 13  │                       │
│ •√MCC to see if it is OK  │          ├────────────────────────────┤
│   to perform the State    │          │ •  Continue normal         │
│   Transition.             │          │    operations.             │
└─────────────┬────────────┘          └────────────────────────────┘
              │
              ▼
          ┌─────┐
          │ 14  │
          └─────┘
```

⑤
Transitioning the MDM from one state to another will reset the bus configuration and may fix the failure. The steps in this box are not the same as those in the MDM Reconfiguration procedure where we put the MDM in new state permanently. The N1-2 MDM will not stay in the new state permanently here. It will go back to Primary state after 20 seconds in standby automatically.

⑥
N1-1 MDM will not go back to Secondary state automatically. It has to be commanded.

⑦
Reinitializing the MDM will affect the operation of the entire MDM which will affect all other subsystems. Make sure that all other disciplines agree with the execution of this step. PCS connected to N1-1 is required.

12

⑤
| 14 | Perform MDM State Transition |

Node 1: C&DH: MDM N1-2

> PRIMARY NCS MDM Node1

'MDM Major State'
- •√State - Primary
- •√MDM ID - N1-2
- • sel Commands
- • **cmd** Prim_NCS_Xsitn_ Stby State **Execute**
- •√Loss PCS telemetry
- • Wait 20 seconds
- •√Recover telemetry
'MDM Major State'
- •√State - Primary
- •√MDM ID - N1-2

9

⑤ ⑥
| 15 | Perform MDM State Transition |

Node 1: C&DH: MDM N1-1

> SECONDARY NCS MDM Node1

'MDM Major State'
- •√State - Secondary
- •√MDM ID - N1-1
- • selCommands
- • **cmd** Second_NCS_ Xsitn_Stby_State **Execute**
- • Wait for TBD seconds
'MDM Major State'
- •√State - Standby
- •√MDM ID - N1-1
- • sel Commands
- • **cmd** N1_1_MDM_Xsitn_ Second_State **Execute**
- • Wait for TBD seconds
'MDM Major State'
- •√State - Secondary
- •√MDM ID - N1-1

| 16 | √Bus Recovery |

Node 1: C&DH: MDM N1-1

> SECONDARY NCS MDM Node1

Is the attention symbol gone and does color change from yellow to green on Orb bus (If this is the failed bus)? — No → 21

Yes

| 17 | √Bus Recovery |

Node 1: C&DH: MDM N1-2

> PRIMARY NCS MDM Node1

Is the attention symbol gone? — Yes →

No

⑦
| 19 | |
- •√**MCC** to see if it is OK to Reinitialize the MDM.

22

| 18 | Transient failure. |

| 20 | |
- • Continue normal operations.

16

⑦

21
•√**MCC** to see if it is OK to reinitialize the MDM.

↓

23	Reset SPD 1553 Card.

Node 1: C&DH: MDM N1-1

SECONDARY NCS MDM Node1

- Select SPD Card that contains the failed bus 'SPD_Card_X'
- Record SPD_1553_ Card_X_ Rset_Cntr -
- sel 'Commands'
- **cmd** N1_1_MDM_Rset_ 1553_Card_Slot_X **Execute**

SPPD_1553_Card_X_ Rset_Cntr - Increment

↓

25	Transition to Diagnostic

- Perform G. TRANSITIONING N1-1 TO OFF/DIAGNOSTIC/ STANDBY FROM SECONDARY WHILE N1-2 IS PRIMARY (ISS OPS: C&DH) to bring the N1-1 MDM to Diagnostic State, then:

↓

27

19

⑧

22	Reset SPD 1553 Card.

Node 1: C&DH: MDM N1-2

PRIMARY NCS MDM Node1

- Select SPD Card that contains the failed bus. 'SPD_Card_X'
- Record SPD_1553_ Card_X_ Rset_Cntr -
- sel 'Commands'
- **cmd** N1_2_MDM_Rset_ 1553_Card_Slot_X **Execute**
- √SPPD_1553_Card_X_ Rset_Cntr - Increment

↓

24	Transition to Diagnostic

- Perform A. TRANSITIONING N1-2 TO DIAGNOSTIC/STANDBY/ OFF FROM PRIMARY 3 N1-1 TO PRIMARY FROM SECONDARY/ STANDBY (ISS OPS: C&DH) to bring the N1-2 MDM to Diagnostic State and N1-1 to Primary State, then:

↓

26

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⑦
Reinitializing the MDM will affect the operation of the entire MDM which will affect all other subsystems. Make sure that all other disciplines agree with the execution of this step. PCS connected to N1-1 is required.

⑧
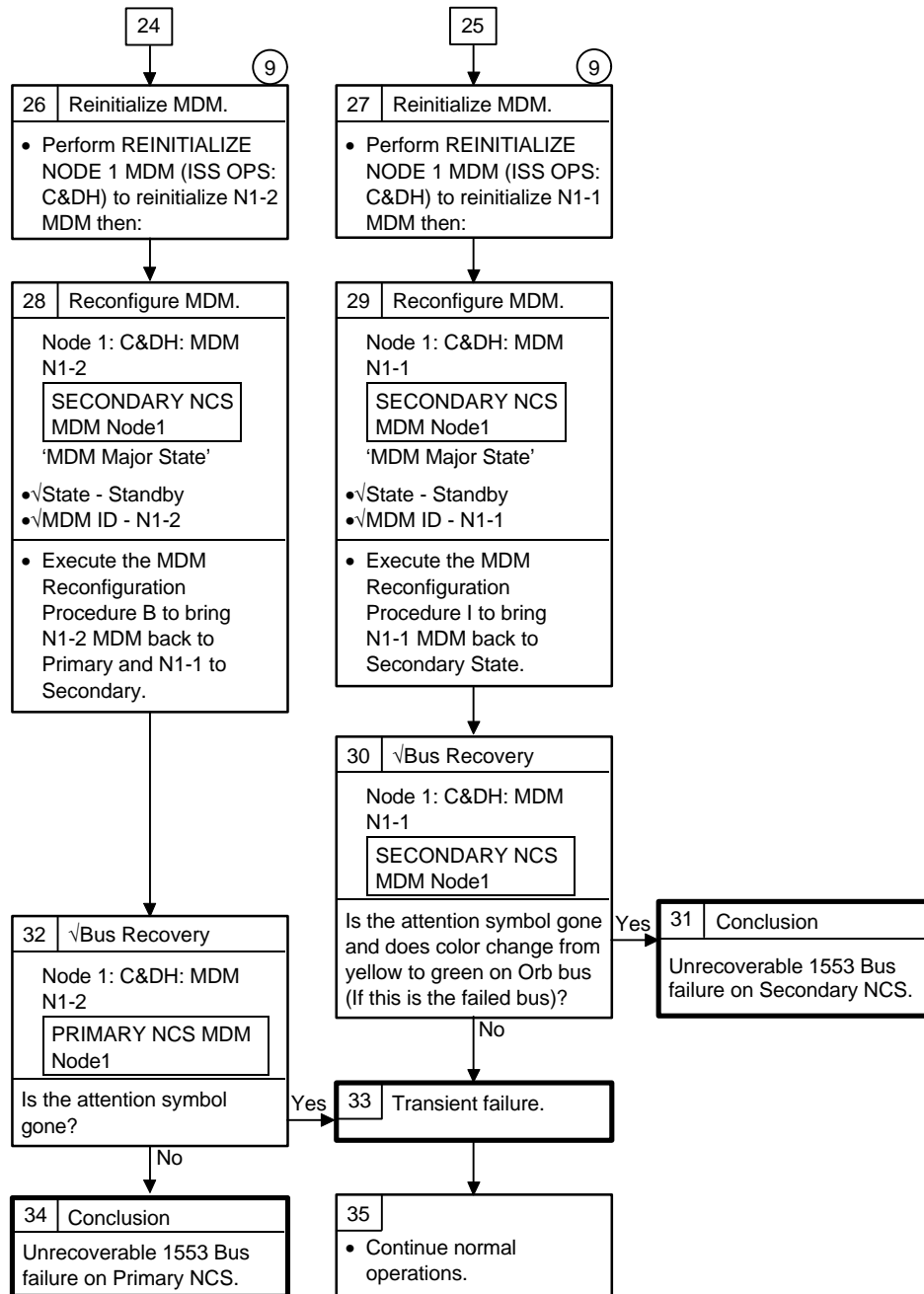Resetting the SPD 1553 Card will not reestablish I/O on the buses. So, resetting the SPD Card and reinitializing the MDM is actually one single action in the attempt to recover the bus failure.

X = 0 for SPD 0.

X = 1 for SPD 1.

⑨ Reinitializing the MDM from EEPROM will clear the station old configuration.

┌─────┐
│ 24 │
└─────┘
  ↓   ⑨

| 26 | Reinitialize MDM. |

• Perform REINITIALIZE NODE 1 MDM (ISS OPS: C&DH) to reinitialize N1-2 MDM then:

  ↓

| 28 | Reconfigure MDM. |

Node 1: C&DH: MDM N1-2

┌─────────────────┐
│ SECONDARY NCS   │
│ MDM Node1   │
└─────────────────┘

'MDM Major State'

• √State - Standby
• √MDM ID - N1-2

• Execute the MDM Reconfiguration Procedure B to bring N1-2 MDM back to Primary and N1-1 to Secondary.

  ↓

┌─────┐
│ 25 │
└─────┘
  ↓   ⑨

| 27 | Reinitialize MDM. |

• Perform REINITIALIZE NODE 1 MDM (ISS OPS: C&DH) to reinitialize N1-1 MDM then:

  ↓

| 29 | Reconfigure MDM. |

Node 1: C&DH: MDM N1-1

┌─────────────────┐
│ SECONDARY NCS   │
│ MDM Node1   │
└─────────────────┘

'MDM Major State'

• √State - Standby
• √MDM ID - N1-1

• Execute the MDM Reconfiguration Procedure I to bring N1-1 MDM back to Secondary State.

  ↓

| 30 | √Bus Recovery |

Node 1: C&DH: MDM N1-1

┌─────────────────┐
│ SECONDARY NCS   │
│ MDM Node1   │
└─────────────────┘

Is the attention symbol gone and does color change from yellow to green on Orb bus (If this is the failed bus)? ──Yes──→

| 31 | Conclusion |

Unrecoverable 1553 Bus failure on Secondary NCS.

No ↓

| 32 | √Bus Recovery |

Node 1: C&DH: MDM N1-2

┌─────────────────┐
│ PRIMARY NCS MDM │
│ Node1   │
└─────────────────┘

Is the attention symbol gone? ──Yes──→

| 33 | Transient failure. |

No ↓   ↓

| 34 | Conclusion |

Unrecoverable 1553 Bus failure on Primary NCS.

| 35 | |

• Continue normal operations.

⑩
The Auto switchover must has been inhibited for a reason. It is necessary to make sure that there are no critical functions being performed on the other channel that may be hazardous if enabled.

⑪
Before the bus is declared fail, every single RT on the bus has to fail. The RTs on the failed bus are disabled prior to setting the bus failure flag bit. The RTs will have to be re-enabled to be able to see if the bus works on the other channel. Use the RT # to RT Ops Names Matrix to enable the active RTs on this bus.

3

⑩

36
•√**MCC**
OK to enable the channel switch over on this bus?
Yes   No

6

38	Enable Channel Switchover.
'Bus Status'
• sel Commands
• **cmd** Bus_XX_Ch_Sw_ Inib_Stat **Execute**
Bus Status
•√Ch_Sw_Inhit_Stat - blank (Ena)

⑪

40	Enable RTs on the Bus.
'Bus Status'
• sel RT Status
•√RT Enabled - All blanks
• seL Ena_RT_Commnads
• **cmd** Bus_XX_Ena_ XX_RT **Execute**
• Enable all active RTs.
•√RT Enabled - Xs on all active RTs

43

5

⑩

37
•√**MCC**
OK to enable the channel switch over on this bus?
Yes   No

7

39	Enable Channel Switchover.
'Bus Status'
• sel Commands
• **cmd** Bus_XX_Ch_Sw_ Inib_Stat **Execute**
Bus Status
•√Ch_Sw_Inhit_Stat - blank (Ena)

⑪

41	Enable RTs on the Bus.
'Bus Status'
• sel RT Status
•√RT Enabled - All blanks
• sel Ena_RT_Commnads
• **cmd** Bus_XX_Ena_ XX_RT **Execute**
• Enable all active RTs.
•√RT Enabled - Xs on all active RTs

42

```
                                          ┌──────┐
                                          │  41  │
                                          └──┬───┘
                                             │
                                             ▼
                              ┌───────────────────────────────┐
                              │ 42 │ √Bus Recovery            │
                              ├───────────────────────────────┤
                              │ Node 1: C&DH: MDM             │
                              │ N1-1                          │
                              │  ┌─────────────────────┐      │
                              │  │ SECONDARY NCS       │      │
              ┌──────┐        │  │ MDM Node1           │      │
              │  40  │        │  └─────────────────────┘      │
              └──┬───┘        │ Is the attention symbol gone  │
                 │            │ and does color change from    │ No  ┌──────┐
                 ▼            │ yellow to green on Orb bus     ├────▶│  7   │
   ┌────────────────────────┐│ (If this is the failed bus)?  │     └──────┘
   │ 43 │ √Bus Recovery     │└───────────────┬───────────────┘
   ├────────────────────────┤                │ Yes
   │ Node 1: C&DH: MDM      │                │
   │ N1-2                   │                ▼
   │  ┌──────────────────┐  │      ┌───────────────────────────┐
   │  │ PRIMARY NCS MDM  │  │      ┃ 44 │ Transient failure.   ┃
   │  │ Node1            │  │      └─────────────┬─────────────┘
   │  └──────────────────┘  │ Yes                │
   │ Is the attention symbol├────▶               │
   │ gone?                  │                    ▼
   └────────────┬───────────┘          ┌───────────────────────┐
                │ No                    │ 45                    │
                ▼                       │ • Continue normal     │
            ┌──────┐                    │   operations.         │
            │  6   │                    └───────────────────────┘
            └──────┘
```